

OBSERVATIONS ON THE FROST RESISTANCE OF THE FERNOR WALNUT VARIETY DURING THE REST PERIOD (JANUARY-APRIL), UNDER THE PEDOCLIMATIC CONDITIONS IN SĂLCIOARA AREA, DÂMBOVIȚA COUNTY

OBSERVAȚII ASUPRA REZISTENȚEI LA ÎNGHEȚ A SOIULUI DE NUC FERNOR, ÎN TIMPUL PERIOADEI DE REPAUS (IANUARIE-APRILIE), ÎN CONDIȚIILE PEDOCLIMATICE DIN ZONA SĂLCIOARA, JUD. DÂMBOVIȚA

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Abstract. *It is well known that walnut varieties with lateral fructification have a lower resistance to temperature variations during relative rest and on the entering vegetation. In the first decade of January 2017, in Salcioara village, Dambovita county there was recorded extremely high variations in the negative temperatures, which could affect the viability of the male florids (men) and the small unisixed female buds. At the end of April (26-28 April) there were late spring frosts that caused massive tissue necrosis of young tissues in native walnut trees and partial frosts of male 'Fernor' sprouts found in the phenophase of swelling of the buds. If the autochthonous genotypes produced 80% of the production of walnuts in the year 2017, these late frosts did not affect the subsequent development of fruit buds in the 'Fernor' variety. Approximately 10% of male florid shoots (avenues) showed partial frostbite without having their total pollen emission capacity and 3% of small buds unisixed females were affected by frost.*

Key words: *Juglans regia L., late frosts, Fernor, frost resistance*

Rezumat. *Este cunoscut faptul că soiurile de nuc cu fructificație laterală prezintă o rezistență mai scăzută la variațiile de temperaturi din timpul repausului relativ și a celor de la intrarea în vegetație. În prima decadă a lunii ianuarie 2017, în Com. Sălcioara, jud. Dâmbovița s-au înregistrat variații extrem de mari a temperaturilor negative, fapt ce putea să afecteze viabilitatea mugurilor floriferi masculi (amenți) și a mugurilor micști unisexuați femeli. La sfârșitul lunii aprilie (perioada 26-28 IV) s-au înregistrat înghețuri târzii de primăvară ce au cauzat necrozări în masă ale țesuturilor tinere la pomii din populațiile de nuc autohtone și degerături parțiale ale unor muguri floriferi masculi din soiul Fernor aflați în fenofaza de umflare a mugurilor. Dacă la genotipurile autohtone producția de nuci a anului 2017 a fost compromisă în proporție de 80%, la soiul Fernor aceste înghețuri târzii de primăvară nu au afectat dezvoltarea ulterioară a mugurilor de rod. Aproximativ, 10% din mugurii floriferi masculi (amenți) au prezentat degerături parțiale, fără a fi*

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afectată total capacitatea lor de a emite polen și 3% din mugurii micști unisexuați femeli au fost afectați de îngheț.

Cuvinte cheie: *Juglans regia* L., înghețuri târzii de primăvară, Fernor, rezistența la îngheț

INTRODUCTION

Because in the last 10 years, in the variety conveyor of walnut varieties cultivated in Romania have made places and walnut varieties with lateral fructification of foreign origin (American, Hungarian, French, Turkish, Moldavian), there is required research on their evolution under the pedoclimatic conditions of Romania.

All fruit trees are more or less affected by early autumn frosts and late spring frosts. The likelihood of frost loss increases when negative weather events overlap the frostiness of trees. Frost sensitivity is inversely proportional to frost resistance. During the annual cycle of vegetation and latency, the autumn and spring transition periods are risky in terms of frost resistance. Likelihood of autumn or spring frost is comparable (Spulak and Balcar, 2013).

The behavior of walnut varieties with lateral fructification and the results obtained depend on applied technologies and climatic conditions (Botu *et al.*, 2010).

Fertilized trees are more vulnerable to frost damage. Application of fertilizer with nitrogen in late summer or early autumn decreases frost resistance (Thomas and Blank, 1996). Phosphorus, which is involved in cell division, is important for the recovery of tissue damage. Potassium has a favorable effect on the regulation of water and plant photosynthesis, but its effect on frost protection is not clear (Snyder *et al.*, 2005).

In conclusion, from September to January, the dynamics of the acclimatization process was determined by the environment, mainly because since January, by the removal of the buds, the effect of genotype on the tolerance and avoidance of frost was identified. (Charrier *et al.*, 2011)

MATERIAL AND METHOD

The present study is conducted under the climatic conditions of Salcioara village, Dâmbovița county (10 km from the town of Titu). In the collection of varieties owned by Kiss Iosif Karoly.

The observations were made on 100 'Fernor' walnut trees, planted in 2010, using an 8 x 4 m planting scheme. The culture substrate was analyzed in the OSPA Cluj Napoca laboratory during 2013. The general climatic data specific to the area were provided by OSPA Cluj. Data on meteorological developments were provided by the National Meteorological and Hydrological Agency through its own website. In periods of interest, with negative national temperatures, data on temperature and snow cover were collected at intervals of up to 4-6 hours. The main meteorological feature was the cooling effect of the wind because it influences in the field the resistance of vegetative buds and flowering buds and, implicitly, the fructification capacity of the trees. During 2016 and 2017 no treatments with systemic and contact

fungicides were applied. In 2017, there were applied 10 doses of foliar vermicompost liquid extract, 2 liters / ha, diluted in 200 liters of water, from 1st of May until 15th of July. The agrochemical content of the vermicompost used was analyzed in the Laboratory of Physical and Chemical Analysis for Soil Science, Agrochemistry and Soil Protection at INCDPAPM-ICPA Bucharest. In the spring of 2017, the physiological status of female young buds, male florid buds, and whether total or partial frosts of annual increases were recorded. On 1st of July 2017, there was evaluated the increases in length and diameter and the quality of floral induction (of the atems) and the ratio of the spruce to the diameter of the shoots raised in 2017.

RESULTS AND DISCUSSIONS

Resistance to wintering is influenced by: the hereditary factor, the degree of hardening of the trees for winter; age of trees; temperature oscillations during winter; the land exhibition and the technology applied the previous year. This attribute is determined not only by the singular effect of the temperature (as low as possible), but also by the winter weather and the ability of the plant to adapt to higher temperature amplitudes combined with the existence or lack of snow.

In the spring of 2017, tree temperatures at the crown level were lower (by 3-4 °C) due to the cooling effect of the wind. Thus, on 04.04.2017, 8.00 hours, the air temperature in the Titu area was 0 °C and the cooling coefficient was -3 °C. (figures 1 and 2). Under these conditions, there was no evidence of dry annual growths caused by frostbite in the first year branches where the ratio of bone marrow to branch diameter was less than 1:3.

When the ratio between the bone marrow and the diameter of the branch was higher than 1:1.5, drying of the annual growth occurred. Also, partial and total frosts were recorded at 10% of the aphids and 3% of the small female buds on annual growths with a ratio between the bone marrow and the diameter greater than 1:3 and less than 1:2.

Temperature shocks and high amplitudes in February-March (temperature amplitudes may sometimes reach +15 °C, a phenomenon commonly found in the southern part of the country, can cause significant damage to walnuts by affecting fruit buds) (tab. 1)

At the end of April (26-28 IV) there were late spring frosts that caused massive necrosis of young tissues to the trees of indigenous walnut populations and partial frostbite of male 'Fernor' sprouts found in the phenophase of swelling of the buds.

If the autochthonous genotypes produced 80% of the production of walnuts in the year 2017, these late frosts did not affect the subsequent development of fruit buds in the 'Fernor' variety. Approximately 10% of the male florid buds (avenues) showed partial frostbite, without having their total pollen emission capacity and 3% of the small buds unisexed females were affected by frost (figures 3 and 4).

This period is characterized primarily by the intense increase in water content, which confirms the passage of the buds to a more pronounced or

elongation of the cells, which is connected with an influx of water higher than in the case of embryonic growth.

Table 1

Evolution of climatic elements measured in Sălcioara village, Dâmbovița county, in 2013 (Climate Atlas of Romania), OSPA Cluj 2013

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Monthly Median Monthly Air Quality (°C)	-5	-3	3	7	14	18	21	20	14	8	3	-2
Average daily minimum (°C)	-3	-1	6	12	17	20	23	22	16	12	5	-1
Maximum absolute air temperature (°C)	20	23.3	25	30.1	35.6	36.6	39.8	39.4	38.8	34.2	28	19.1
Absolute minimum air temperature (°C)	-30	-27	-19	-8	-1	4.2	8	5.6	-2.3	-3.6	-13.2	-22
Atmospheric precipitation (mm)	37	37	34	49	76	88	77	61	44	35	47	44

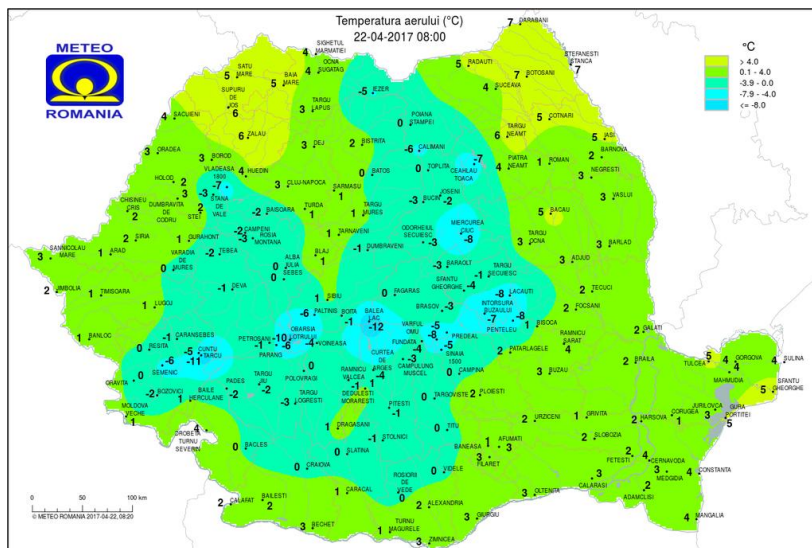


Fig. 1 The air temperature recorded at Romania level, on 22.04.2017

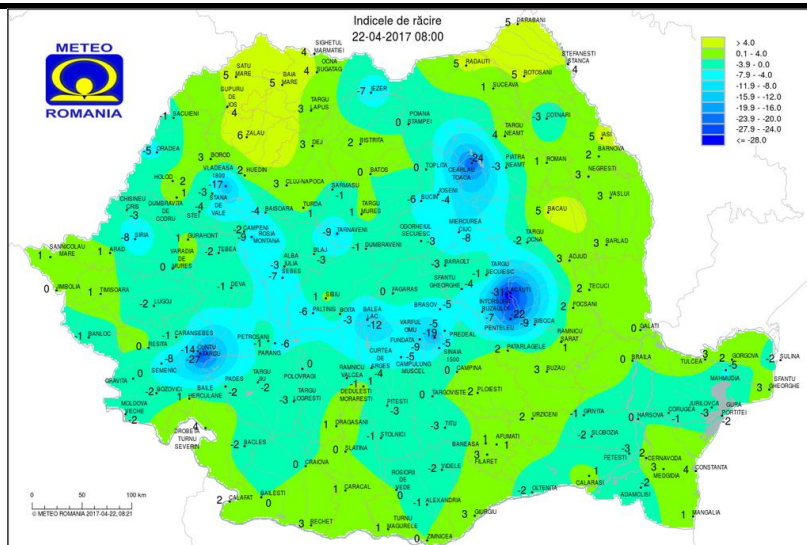


Fig. 2 Cooling index, recorded on 22.04.2017



Fig. 3 Aspects of damage as a consequence of the late spring frost in the walnut native varieties



Fig. 4 Aspects of damage as a consequence of the late spring frost in the 'Femor' Walnut variety

In 2017 there were no *Xantomonas campestris* and *Gnomonia leptostyla* attacks above the economic damage threshold, on the foliage of foliage treatments with vermicompost liquid extract.

CONCLUSIONS

In order to reduce the risk of frost caused by the cooling effect of the wind, it is advisable to create a protection curtain around the plantation, of rapidly growing species.

Nitrogen fertilization from the walnut orchard will stop at the latest on 15th of July. The optimal ratio of calcium to nitrogen in foliar and basal fertilization influences the frost resistance of walnut varieties with lateral fructification.

Applying foliar treatments with vermicompost liquid extract increases the resistance to walnut-specific pathogens.

To assess the frost resistance of indigenous and foreign walnut varieties, it is recommended to conduct a study in a controlled environment according to the standard practice defined by Diaz R. and Fernando Lopez (2005) for the *Juglans regia*, quoted by N. Aleta *et al.*, 2014.

The parameter to be followed is LT50 (the negative temperature at which a genotype has 50% loss of its cells) (Aleta *et al.*, 2014).

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